

## Appendix 11. Bible Spring 2022 Population Modeling

To complete the population modeling for the Sulphur HMA, version 1.40 of the WinEquus program, created April 2, 2002, was utilized.

### Objectives of Population Modeling

Review of the data output for each of the simulations provided many use full comparisons of the possible outcomes for each alternative. Some of the questions that need to be answered through the modeling include:

- Do any of the Alternatives “crash” the population?
- What effect does population growth suppression have on population growth rate?
- What effects do the different alternatives have on the average population size?
- What effects do the different alternatives have on the genetic health of the herd?

Population Data, Criteria, and Parameters utilized for Population Modeling

All simulations used the survival probabilities, foaling rates, and sex ratio at birth that was supplied with the Winn Equus population for the Garfield HMA.

Sex ratio at Birth: 42% Females; 58% Males

The following percent effectiveness of population growth suppression was utilized in the population modeling for Alternative I: Year 1: 94%

The following table displays the contraception parameters utilized in the population model for Proposed Alternative:

Contraception Criteria

Age	Percentages for Fertility Treatment
1	100%
2	100%
3	100%
4	100%
5	100%
6	100%
7	100%

Age	Percentages for Fertility Treatment
8	100%
9	100%
10-14	100%
15-19	100%
20+	100%

### Population Modeling Criteria

The following summarizes the population modeling criteria that are common to the Proposed Action and all alternatives:

- Starting year: 2022
- Initial Gather Year: 2022
- Gather interval: regular interval of three years
- Gather for fertility treatment regardless of population size: Yes
- Continue to gather after reduction to treat females: Yes
- Sex ratio at birth: 58% males
- Percent of the population that can be gathered: 80%
- Minimum age for long-term holding facility horses: Not Applicable (Gate Cut)
- Foals are included in the AML
- Simulations were run for 10 years with 100 trials each.

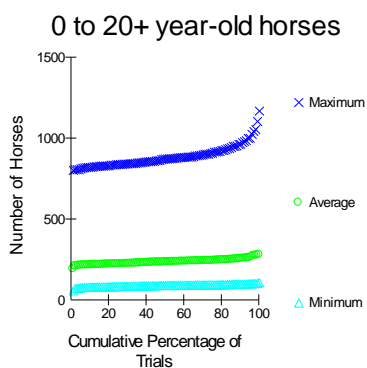
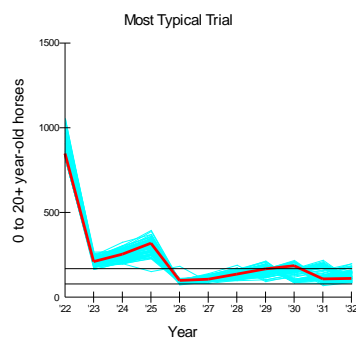
The following table displays the population modeling parameters utilized in the model:

Population Modeling Parameters Modeling Parameter	Alternatives 1: Proposed Action- Gather and Removal of Excess Wild Horses and Application of Population Growth Suppression	Alternative 2: Gather and Removal of Excess Wild Horses without Population Growth Suppression.	Alternative 3: No Action – Continue Existing Management. No Gather and Removal
Management by removal only	No	Yes	No
Threshold Population Size Following Gathers	80	80	N/A
Target Population Size Following Gathers	80	80	N/A
Gather for Population Growth Suppression regardless of population size	Yes	No	N/A

Population Modeling Parameters Modeling Parameter	Alternatives 1: Proposed Action- Gather and Removal of Excess Wild Horses and Application of Population Growth Suppression	Alternative 2: Gather and Removal of Excess Wild Horses without Population Growth Suppression.	Alternative 3: No Action – Continue Existing Management. No Gather and Removal
Gather continue after removals to treat additional females	Yes	Yes	N/A
Effectiveness of Population Growth Suppression: Year 1	94%	N/A	N/A

**Results Alternative 1: Proposed Action –Gather and Removal of Excess Wild Horses and Application of Population Growth Suppression.**

**Population Size**



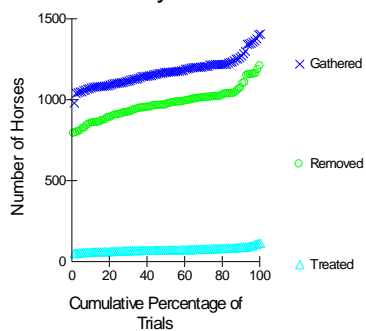
**Population Sizes in 11 Years\***

	Minimum	Average	Maximum
Lowest Trial	59	192	804
10th Percentile	82	217	824
25th Percentile	86	223	840
Median Trial	92	236	875
75th Percentile	96	245	914
90th Percentile	100	257	971
Highest Trial	109	281	1171

\* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number 0 to 20+ year-old horses ever obtained was 59 and the highest was 1171. In half the trials, the minimum population size in 11 years was less than 92 and the maximum was less than 875. The average population size across 11 years ranged from 192 to 281.

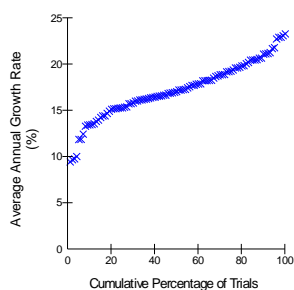
0 to 20+ year-old horses



Totals in 11 Years\*

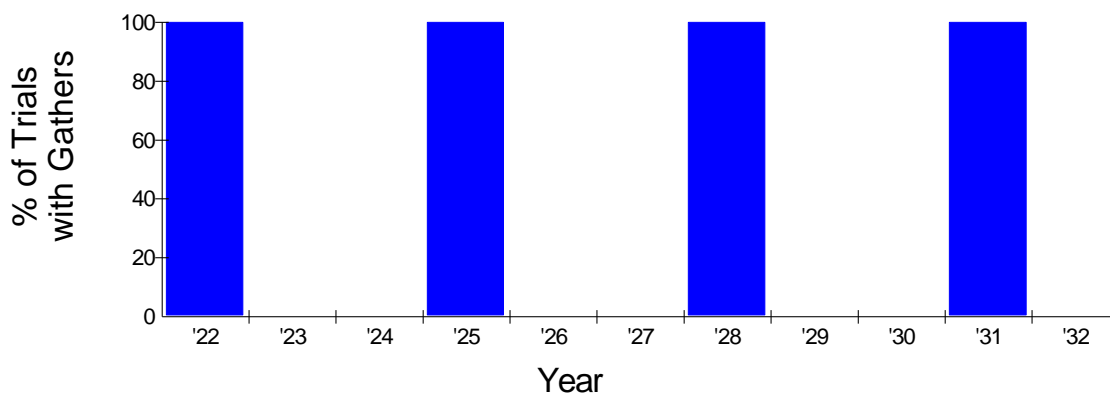
	Gathered	Removed	Treated
Lowest Trial	983	793	53
10th Percentile	1079	856	62
25th Percentile	1108	910	68
Median Trial	1174	972	74
75th Percentile	1221	1020	82
90th Percentile	1281	1087	92
Highest Trial	1410	1210	117

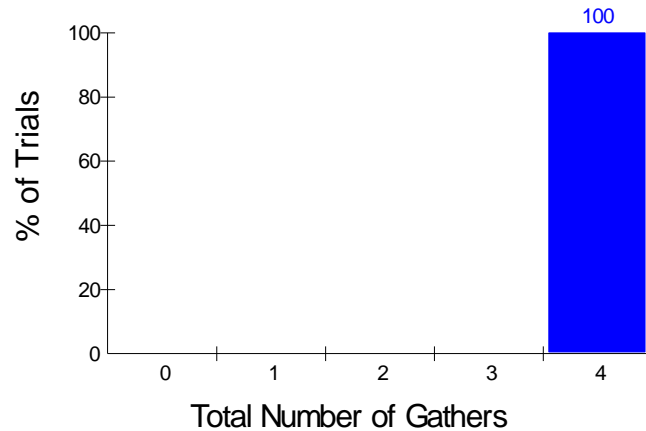
\* 0 to 20+ year-old horses



Average Growth Rate in 10 Years

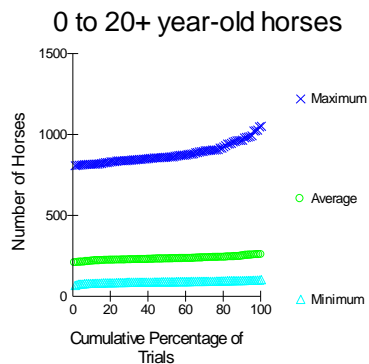
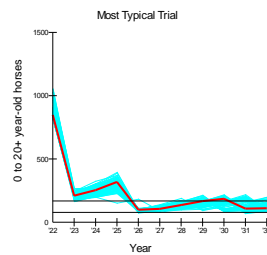
Lowest Trial	9.5
10th Percentile	13.5
25th Percentile	15.4
Median Trial	17.2
75th Percentile	19.4
90th Percentile	21.1
Highest Trial	23.3





## Results Alternative 2: Gather and Removal of Excess Wild Horses without Population Growth Suppression

### Population Size



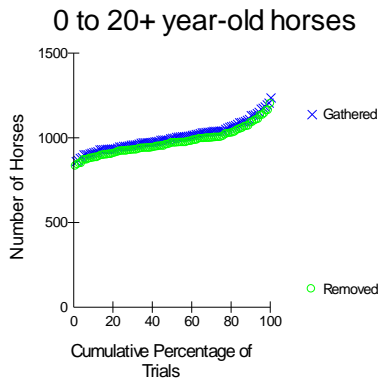
### Population Sizes in 11 Years\*

	Minimum	Average	Maximum
Lowest Trial	70	207	811
10th Percentile	83	218	820
25th Percentile	88	223	841
Median Trial	93	231	864
75th Percentile	96	240	908
90th Percentile	100	250	976
Highest Trial	106	257	1055

\* 0 to 20+ year-old horses

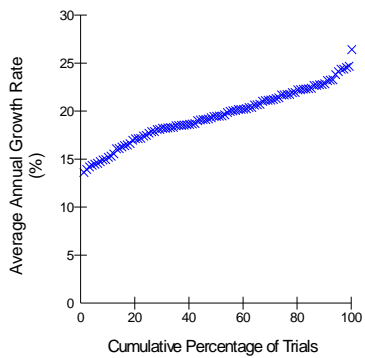
In 11 years and 100 trials, the lowest number 0 to 20+ year-old horses ever obtained was 70 and the highest was 1055. In half the trials, the minimum population size in 11 years was less than 93 and the maximum was less than 864. The average population size across 11 years ranged from 207 to 257.

### Totals in 11 Years\*



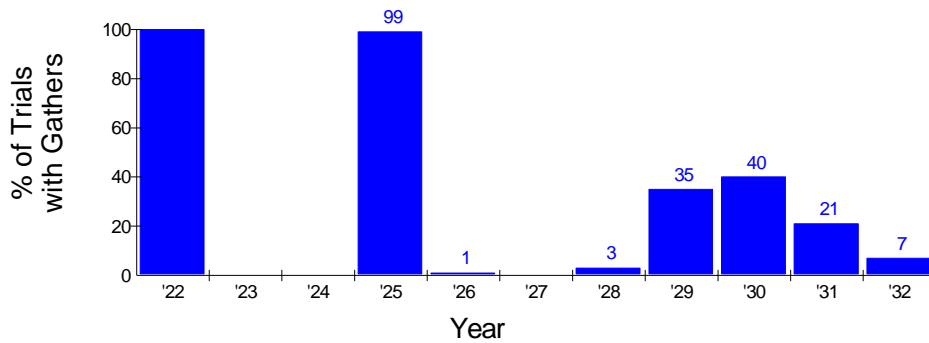
	Gathered	Removed
Lowest Trial	863	833
10th Percentile	918	882
25th Percentile	954	922
Median Trial	1001	970
75th Percentile	1044	1006
90th Percentile	1136	1090
Highest Trial	1240	1201

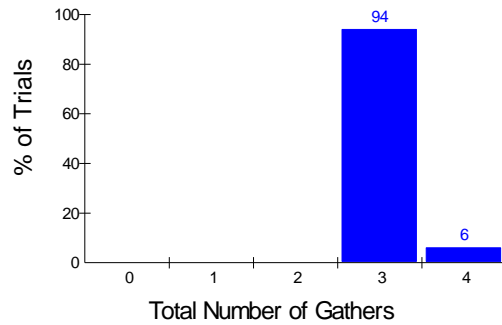
\* 0 to 20+ year-old horses



### Average Growth Rate in 10 Years

Lowest Trial	13.7
10th Percentile	15.3
25th Percentile	17.8
Median Trial	19.5
75th Percentile	21.8
90th Percentile	23.1
Highest Trial	26.5

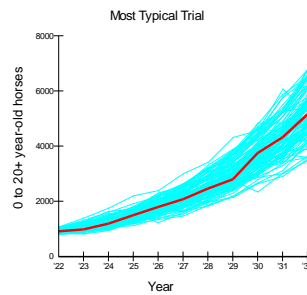




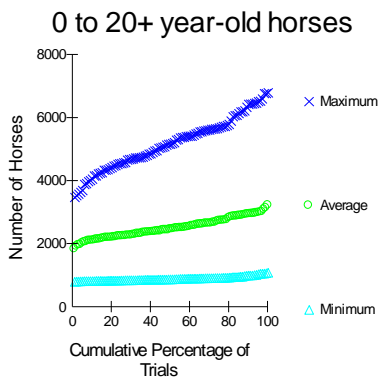
### Results Alternative 3: No Action – No Gather, Removal or use of Population Growth Suppression

#### Results - No Action

#### Population Size



#### Population Sizes in 11 Years\*

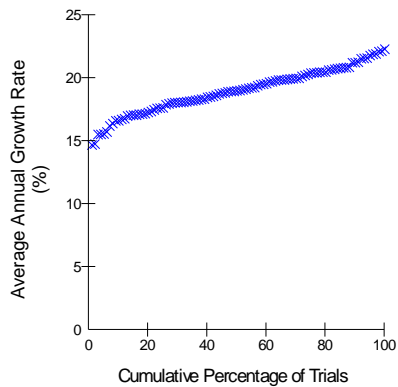


	Minimum	Average	Maximum
Lowest Trial	806	1837	3483
10th Percentile	830	2112	4115
25th Percentile	850	2252	4572
Median Trial	882	2467	5186
75th Percentile	928	2737	5704
90th Percentile	1005	2952	6444
Highest Trial	1094	3228	6805

\* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number 0 to 20+ year-old horses ever obtained was 806 and the highest was 6805. In half the trials, the minimum population size in 11 years was less than 882 and the maximum was less than 5186. The average population size across 11 years ranged from 1837 to 3228.

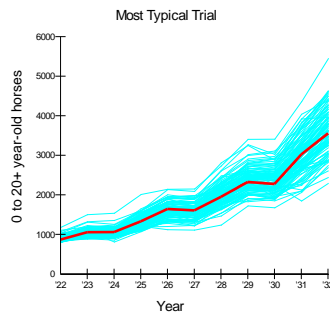
### Average Growth Rate in 10 Years



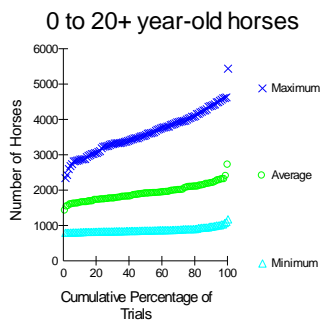
Lowest Trial	14.7
10th Percentile	16.7
25th Percentile	17.8
Median Trial	19.0
75th Percentile	20.4
90th Percentile	21.3
Highest Trial	22.3
* 0 to 20+ year-old horses	

### Alternative Considered but Not Analyzed: Population Growth Suppression Only.

### Population Size



### Population Sizes in 11 Years\*



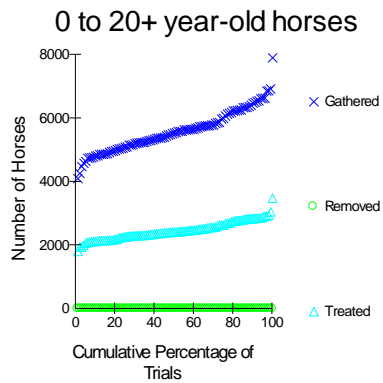
	Minimum	Average	Maximum
Lowest Trial	805	1424	2353
10th Percentile	822	1646	2885
25th Percentile	841	1744	3256
Median Trial	869	1906	3596
75th Percentile	908	2079	4028
90th Percentile	984	2198	4413
Highest Trial	1185	2722	5455

\* 0 to 20+ year-old horses

In 11 years and 100 trials, the lowest number 0 to 20+ year-old horses ever obtained was 805 and the highest was 5455. In half the trials, the minimum population size in 11 years was less than 869 and the maximum was less than 3596. The average population size across 11 years ranged from 1424 to 2722.

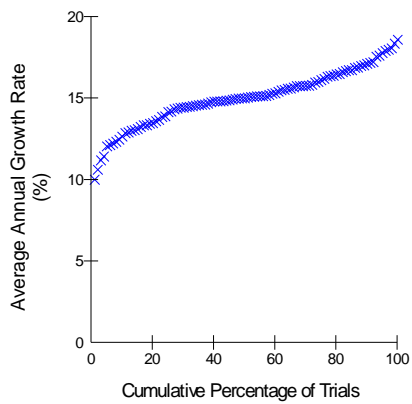


### Totals in 11 Years\*



	Gathered	Removed	Treated
Lowest Trial	4107	0	1812
10th Percentile	4822	0	2128
25th Percentile	5102	0	2274
Median Trial	5550	0	2422
75th Percentile	6042	0	2665
90th Percentile	6498	0	2849
Highest Trial	7912	0	3489

\*0 to 20+ year-old horses



### Average Growth Rate in 10 Years

Lowest Trial	10.0
10th Percentile	12.8
25th Percentile	14.2
Median Trial	15.0
75th Percentile	16.2
90th Percentile	17.2
Highest Trial	18.6

